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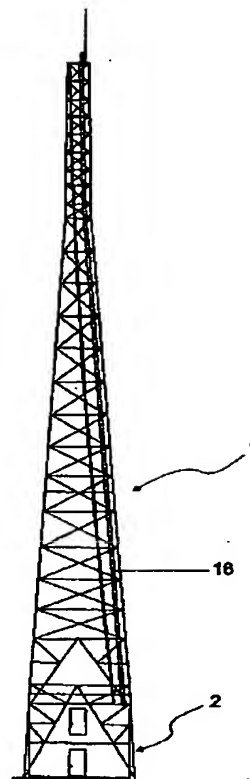
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/BR98/00029 (22) International Filing Date: 28 May 1998 (28.05.98) (30) Priority Data: <div style="display: flex; justify-content: space-between;"> <div> <p>PI 9703325-1 28 May 1997 (28.05.97) BR</p> <p>PI 9801800-0 12 March 1998 (12.03.98) BR</p> </div> <div></div> </div> <p>(71) Applicant (for all designated States except US): SIEMENS LTDA. [BR/BR]; Avenue Mutinga, 3800, CEP-05150-900 São Paulo, SP (BR). (72) Inventor; and (75) Inventor/Applicant (for US only): BITTENCOURT DE MIRA, Sebastião [BR/BR]; Rua União, 323, Apartamento 41, Jundianópolis, Jundiaí, SP (BR). (74) Agent: DANNEMANN, SIEMSEN, BIGLER & IPANEMA MOREIRA; Caixa Postal 2142, CEP-20001-970 Rio de Janeiro, RJ (BR).</p> </p>		<p>(81) Designated States: IL, JP, MX, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: **A SHELTER FOR TELECOMMUNICATIONS EQUIPMENT AND A TOWER FOR TRANSMITTING/RECEIVING ELECTROMAGNETIC SIGNALS**

(57) Abstract

The present invention refers to a telecommunications tower (1, 100), and more specifically to a shelter (2, 40) installed in the internal region of the tower (1, 100) used to protect the electric equipment, such as power sources, transmitters, receivers and other equipment required for transmitting/receiving signals. The present invention foresees a shelter (2, 40), which can be positioned in the internal (air) portion of the base of the tower (1, 100). This objective is achieved by means of a shelter for telecommunications equipment (2, 40), particularly suitable for housing equipment utilized in cell phone systems and other telecommunications systems, this shelter being positioned in the internal region of a telecommunications tower (1, 100), and having a cross section analogous to that of the tower, the shelter (2, 40) being closed by walls (28) which are formed by metallic plates (25, 26) with a filling of an insulating material (27). In addition, the shelter (2, 40) is divided into at least two floors. The present invention further relates to a telecommunications tower (1, 100), particularly utilizable in cell phone systems, which comprises a shelter (2, 40) positioned in its internal region.



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Title: "A SHELTER FOR TELECOMMUNICATIONS EQUIPMENT AND A TOWER FOR TRANSMITTING/RECEIVING ELECTROMAGNETIC SIGNALS"

Background of the Invention

5 The present invention refers to a tower for transmitting/receiving electromagnetic signals, and to a shelter capable of being installed in the inner region of the structure of said tower, the shelter being used for protecting electric equipment such as power sources, transmitters, receivers and other equipment required for transmitting/receiving signals such as those utilized in telecommunications.

Prior art

10 As it is known, towers for transmitting and/or receiving electromagnetic signals are used for fixing antennas, the respective transmission and/or reception equipment being located in a shelter beside the tower. This positioning of the shelter has a high cost, because great losses of signal occurs due to attenuation along the transmission cables, for which reason a more powerful amplifier is required.

15 Another drawback resulting from the construction of the shelter beside the tower is that this arrangement requires works external to said tower for the structural foundation of the shelter, in addition to the infrastructure required for isolating the area around the shelter and the tower, by placing walls, fences, etc.

20 Brazilian Patent Application PI 9703325 of the same applicant, the internal priority of which is claimed herein, describes a shelter arranged in the inner region of the structure of a tower, with the function of protecting transmission/reception equipment.

Object of the invention

25 The main objective of the present invention is to propose a tower having a shelter for electric equipment positioned inside the base of said tower, the structures of said tower and of said shelter being particularly versatile, in order to obtain perfect adaptation to the ground and the conditions in which they will be used.

This objective is achieved by means of a shelter for telecommunications equipment that is positioned in the internal region of a telecommunications tower.

The present invention further refers to a tower for transmitting/receiving electromagnetic signals comprising a shelter for transmission/reception equipment positioned in its
5 internal region.

Detailed description of the invention

This invention will be better understood from a non-limitative example illustrated in the accompanying drawings, in which:

- figure 1 shows a side view of a tower, at the base of which a shelter for equipment according to a first embodiment of the invention is arranged;
10
- figure 2 is a side view of the base of the tower, showing the shelter of figure 1 in a larger detail;
- figure 3 is another side view of the base of the tower, showing the internal arrangement of the equipment in said shelter illustrated in the above figures;
- figure 4 is a cross-section view of the wall of the shelter illustrated in the above
15 figures;
- figure 5 is a front view of the structure of the shelter illustrated in the above figures;
- figure 6 is a top view of the shelter illustrated in the above figures; and
- figure 7 is a side view of the base of the tower, showing in detail the shelter according to a second preferred embodiment of the invention.
20

As illustrated in figure 1, and according to a first preferred embodiment of this invention, the tower 1, which is especially suitable for transmitting and receiving electromagnetic signals, such as radio signals, has a cross-section shaped substantially as an equilateral triangle and comprises a shelter 2 close to the base, which in turn comprises, for instance, a transmission/reception station or a cell phone base radio station (also known as ERB).
25

According to an exemplified embodiment of the invention, the shelter 2 has the shape of a prism with a cross section that is also shaped substantially as an equilateral triangle, measuring approximately 6 m in height and its sides being approximately 5.30 m long. In order to enable its installation inside the structure the tower 1, the dimensions and shape of the shelter 2 should be appropriate to shape of the tower, and may vary according to the type of tower used, the structures of the tower 1 and of the shelter 2 working independently from each other.

As can be seen in figure 2, the shelter 2 is positioned between the big tubes of the tower 1 on a concrete base 30 also triangular in shape (following the shape of the tower 1), designed to serve as an inner pavement for the first floor of the shelter 2. The concrete base 30 is built on a metallic mesh (not shown) so as to obtain a structure having resistance characteristic to a compression preferably of 15 Mpa and an overload of the equipment of 15 kN/m².

As illustrated in figure 5, one foresees the provision of a metallic structure on the concrete base 30 to support the shelter 2. This structure is composed of three metallic longerons 20 forming a triangle that follows the base of the tower 1, which are fixed to the concrete base 30 by means of an expansive anchor bolt 21 (see figure 4). These longerons 20 are preferably manufactured from cold-bent carbon steel plates.

On the vertices of the triangle formed by the longerons 20 main columns 22 are fixed, which are manufactured from metallic plates (preferably of carbon steel), bent so as to form an open triangle with the chamfered vertex 24, and the ends of the sides 23 being bent in accordance with the sides of the prism that forms the shelter 2.

The platform 11 of the second floor is constituted by metallic grids suitably sized for supporting the load of the equipment. Preferably, the grid is manufactured from carbon steel having the capacity of standing a load of 3 kN/m². As illustrated in figure 4, said platform 11 is fixed to the columns 22 by means of screws 29.

The use of a metallic grid facilitates the mounting of matting, electrochutes, conduits, cables, groundings, lamps, etc. In addition, the use of grid unifies the environment, thus facilitating the functioning of detection, alarm, fire-fighting and air-conditioning systems.

The covering 12 of the shelter 2 is placed onto the columns 22 and is preferably manufactured from carbon steel plates having the capacity of standing an overload of 0.5

kN/m². In order to allow the rain-water to drain adequately, the covering 12 should be mounted so as to make an inclination of about 2% with respect to the ground.

The closing of the sides of the shelter 2 is made with walls 28, which are internally and externally coated with metallic plates 25, 26 (preferably of carbon steel), as illustrated in figure 4. The space between the plates 25, 26 is filled with injected polyurethane 27, thus providing a heat and sound insulator of the shelter 2.

Openings (not shown) are also provided in the walls 28 for placing the air-conditioning system.

Access to the shelter 2 is through a door 31, which is equally made of metallic plates, this door being fixed to the doorstop 28. In order to obtain a sealing of the shelter 2, it is foreseen to place rubber onto the doorstops of the door 31.

Optionally, one may foresee a second door at the second floor, in order to allow the electric equipment to be handled, if necessary.

Access to the tower 1 is by the inside of the shelter 2 through an internal staircase 15 and a hatch-type door 18, provided in the covering 12 (figures 3 and 6). The covering for the door 18 has the shape of an equilateral triangle (with sides measuring 700mm) with a flanged entrance, a rubber fitting being provided for sealing against infiltration of water and dust.

On the covering 18, one foresees the provision of antiskid metallic plates (not shown), which lead from the hatch-type opening 18 to the external staircase 16 of the tower 1.

The staircase 16 is of the climbing ladder type and provided with a body protection (not shown) along its entire length. In addition, one foresees the provision of three platforms for internal services (not shown) along the rectilinear stretch of the tower 1 and also the provision of rest platforms with a safety trap (not shown either), every six meters along said tower 1.

The pavement of said first floor is coated with a synthetic material placed onto the concrete base 30.

The location of the shelter 2 inside the structure of the tower 1 provided greater safety against atmospheric discharges and electromagnetic waves, besides providing econ-

omy in grounding the base radio station, since a single mesh can be used for grounding around the tower 1, which also serves to receive grounding rings inside the station.

In addition, the structure of steel plates provides excellent protection against external aggressions, since the electric equipment remains totally insulated, thus providing a self-protected base radio station, installed inside the tower 1.

A second embodiment of this invention foresees the construction of a integrated shelter 40, which is built by making good use of the metallic structure of the tower 100 itself, formed by latticework, and it is only necessary to size adequately the profiles (not shown) that compose the region of the shelter 40.

Thus, the shelter 40 constitutes an overlapped assembly in two or three floors, where the first floor houses power equipment such as batteries, power sources and panels, the second floor houses the specific cell phone equipment and the transmission equipment proper. In case the integrated shelter comprises three floors, the third floor will house transmission equipment.

The platforms of the floors 42, 43 are built on pavements of adequately sized grid, to stand the load of the equipment of the station. The use of a metallic grid facilitates the mounting of matings, electrochutes, conduits, cables, groundings, lamps, as well as detection, alarm and fire-fighting systems.

The integrated shelter 40 is closed by walls 45, preferably composed of concrete cast around a metallic mesh with a glass wool web for thermal protection of the station. Optionally, metallic panels with glass wool coating can be used, these panels being screwed in order to expedite the mounting.

It should be understood that the above description only refers to preferred embodiments of the present invention, the scope of which is defined exclusively by the accompanying claims.

CLAIMS

1- A shelter for telecommunications equipment (2, 40), characterized by being positioned in the internal region of a telecommunications tower (1, 100).

5 2- A shelter (2) according to claim 1, characterized by having a structure that is independent from that of the tower (1).

3- A shelter (40) according to claim 1, characterized by being built by making good use of the structure of the tower (100).

10 4- A shelter according to claim 1, characterized by being closed by walls (28, 45) formed by metallic plates (25, 26) with a filling of an insulating material (27).

5- A shelter according to claim 1, 2, or 3, characterized by being divided into at least two floors.

6- A shelter according to claim 1, 2, or 3, characterized by having a cross section analogous to that of the tower (1, 100).

15 7- A shelter according to claim 1, 2, 3, or 4, characterized by comprising a covering (12).

8- A shelter according to claim 7, characterized in that the covering (12) comprises at least one door (31).

20 9- A shelter according to claim 7, characterized by comprising at least one door (18) for access to the covering (12).

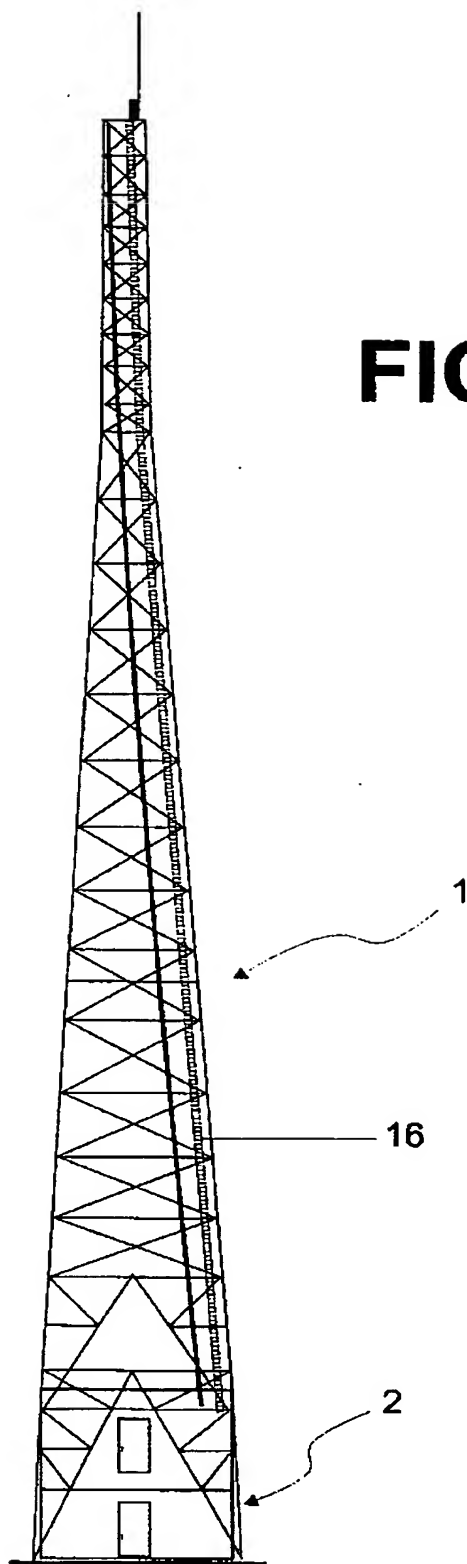
10- A tower for transmitting/receiving electromagnetic signals (1, 100), characterized by comprising a shelter (2,40) for transmission/reception equipment positioned inside it.

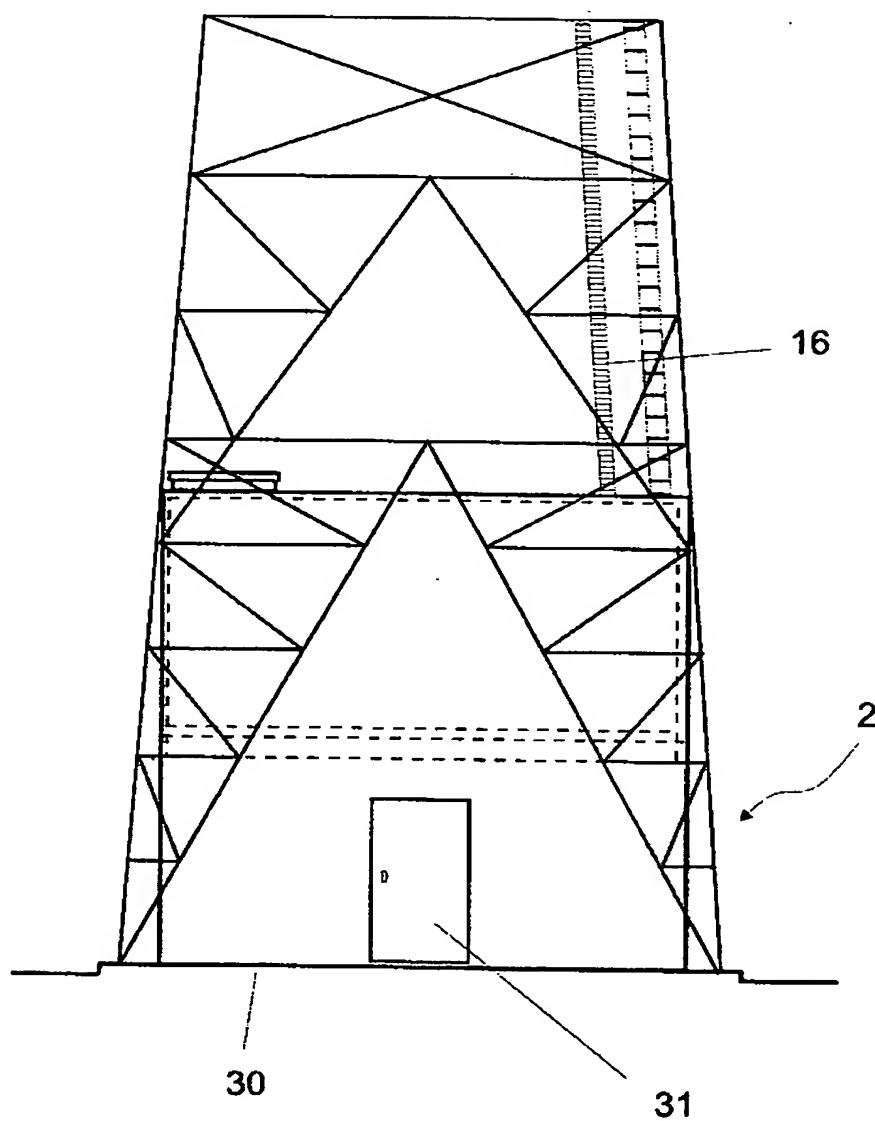
25 11- A tower according to claim 10, characterized by having a structure that is independent from that of the shelter (2).

12- A tower according to claim 10, characterized in that the shelter (40) is built by making good use of the structure of the tower (100).

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FIG. 1



**FIG. 2**

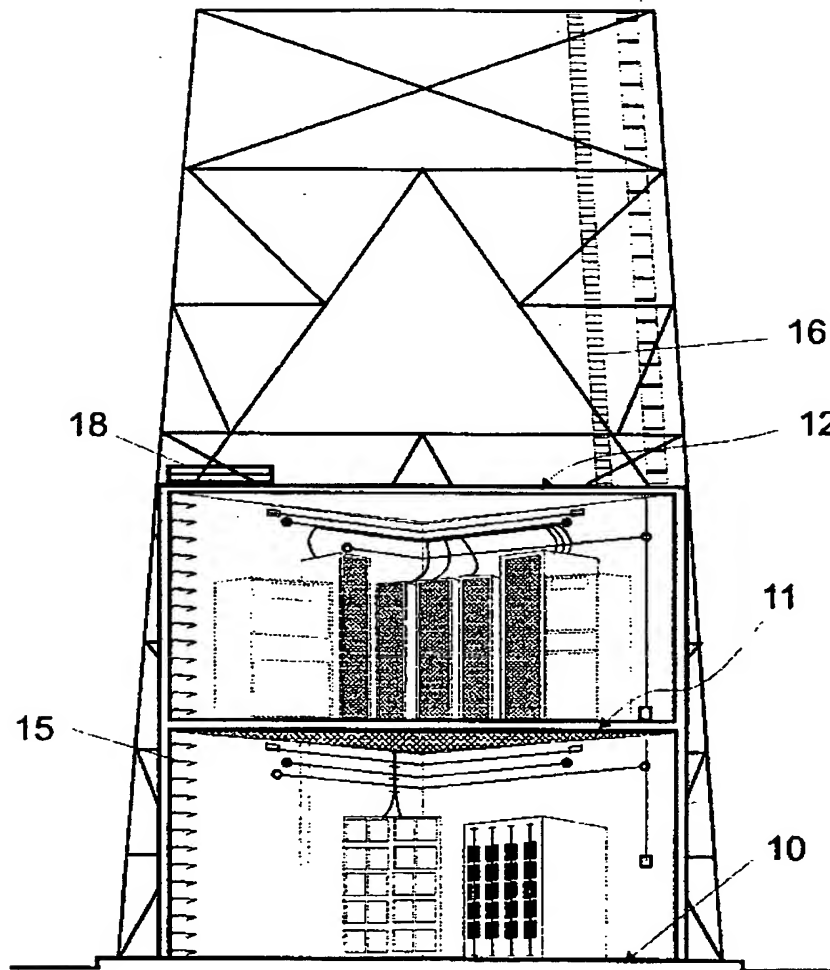


FIG. 3

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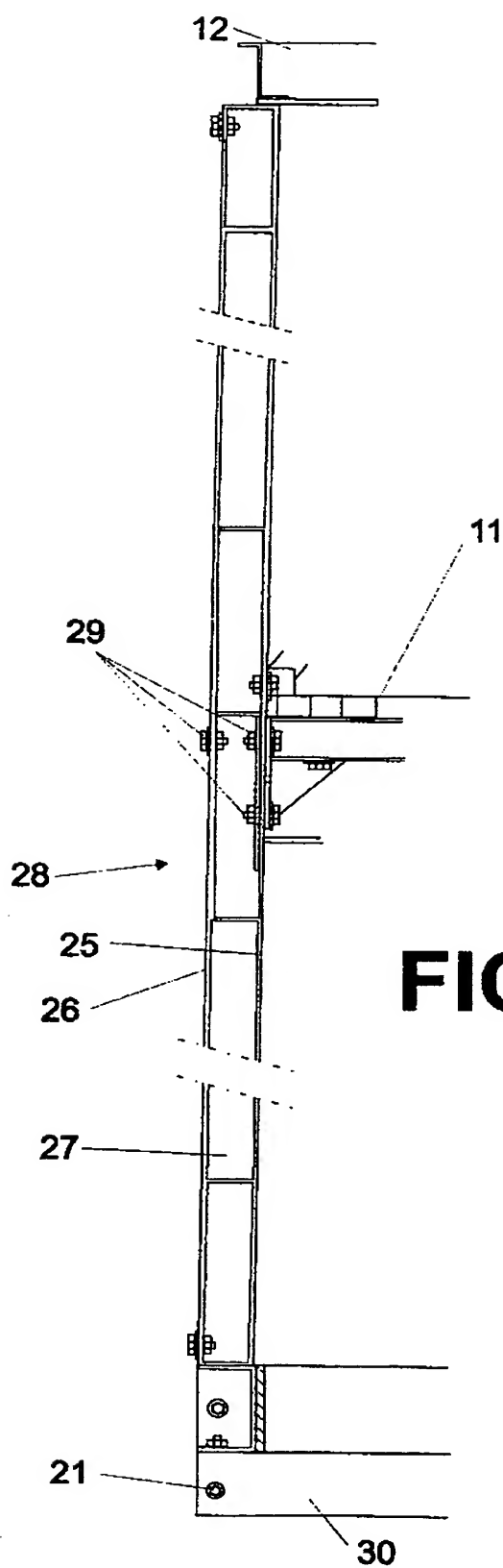
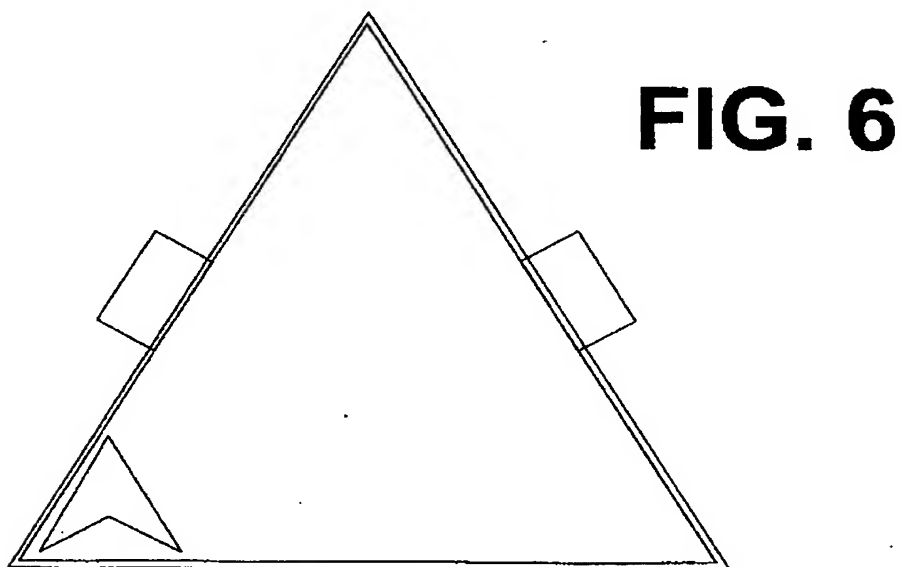
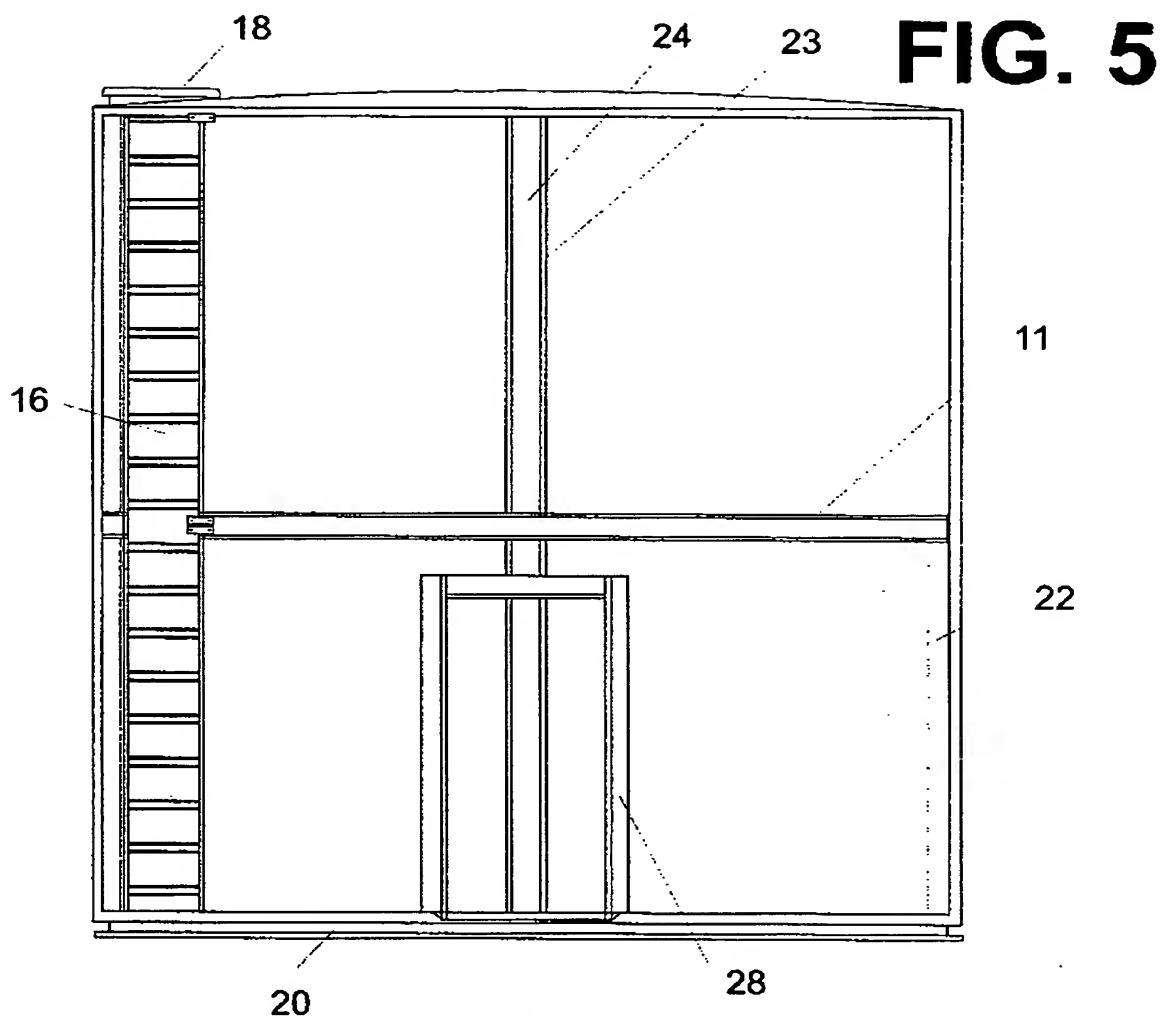


FIG. 4

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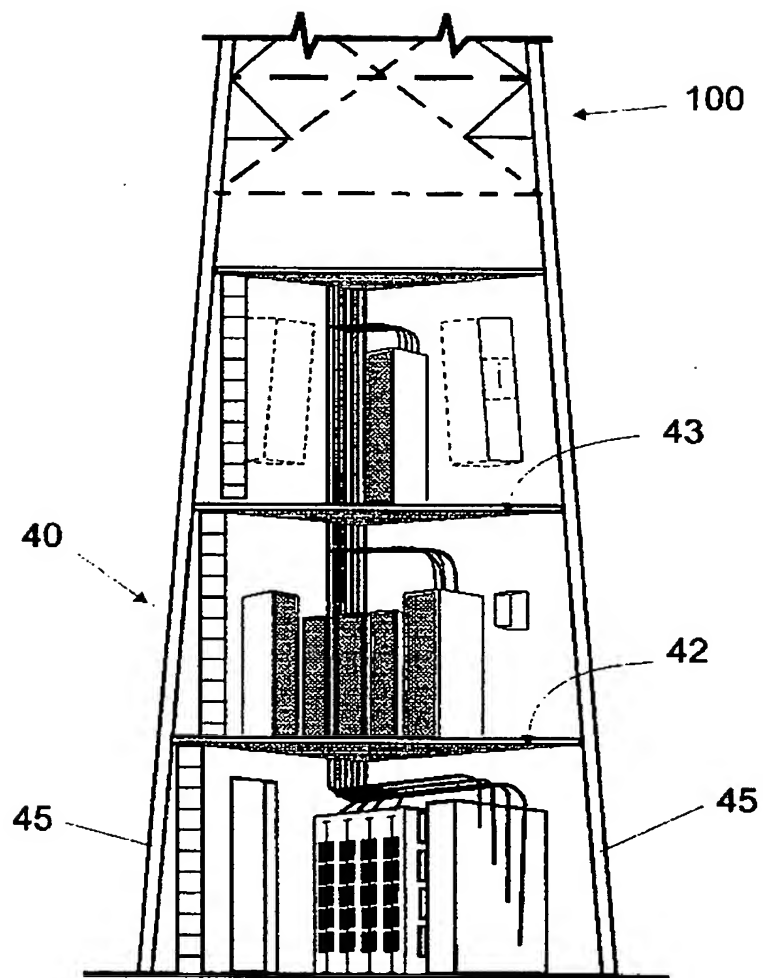


FIG. 7

INTERNATIONAL SEARCH REPORT

In ternational Application No
PCT/BR 98/00029

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E04H12/00 H01Q1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E04H H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KUWAHARA ET AL: "Prefabricated Building System for Radio Relay Stations" REVIEW OF THE ELECTRICAL COMM. LABO., vol. 27, no. 3/4, pages 236-250, XP002078084 Takyo, Japan	1,3, 5-10,12
Y	see page 239, column 2, line 1 - page 240, column 1, line 24 see page 244, column 1, paragraph 2 see figures 2-4	4
Y	US 5 247 770 A (TING RAYMOND M L) 28 September 1993 see column 4, line 1 - line 8 see column 3, line 50 - line 59 see figures 1-3	4

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☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CH 510 807 A (VER. ÖSTERR. EISEN-UND STAHLWERKE AG) 31 July 1971 see column 2, line 27 - line 38 see figure -----	1,2,7, 10,11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
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CH 510807	A	31-07-1971	AT	289205 B	15-02-1971
			DE	2033730 A	11-03-1971